

## DRAWINGS ATTACHED

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 (72) Inventor VLADIMIR JULIEVICH GOLYAKHOVSKY



## (54) ENDOPROSTHESIS OF SHOULDER JOINT

(71) We, TSENTRALNY ORDENA TRUDOVOGO KRASNOGO ZNAMENI NAUCHNO-ISSEDOVATELSKY INSTITUT TRAVMATOLOGII I ORTOPEДИИ ИМЕНИ Н.Н. ПРИОРОВА МИНИСТЕРСТВА ЗДРАВООХРАНЕНИЯ СССР, a corporate body organised and existing under the laws of the Union of Soviet Socialist Republics (USSR) of 10 ulitsa Priorova, Moscow, USSR, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to an endoprosthesis of the shoulder joint applicable in operative mobilization of the shoulder joint.

No endoprostheses of the shoulder joint are known to be presently used in surgical practice. Prostheses of the articular head and metacarpophyseal portion of the humerus made of metal or plastics are known juxtaposed with the articular process of the scapula during surgical operation, without being fixed thereto.

A disadvantage of the heretofore known endoprostheses of the articular head of the humerus resides in that these are not fixed to the articular process of the scapula. This makes the shoulder joint unstable and badly restricts its mobility, since the arm is devoid of a point of support or fulcrum. Moreover, another disadvantage of the hitherto known endoprosthesis of the articular head of the humerus is that its articular surface is incongruent with the articular process of the scapula.

It is an object of the present invention to provide an endoprosthesis of the shoulder joint, viz., a complete substitute of that joint, which gives mobility and stability to the operated shoulder joint because it is adapted to be fixed to the scapular bone.

According to the present invention there is provided an endoprosthesis of the shoulder joint, comprising a pin adapted to

be fixed in the endullary canal of the humerus and provided at one end with a spheroidal head, and a shaped crown having holes therethrough and deformable portions by means of which the crown is adapted to be fixed on the articular process of the scapula, the crown having a part spherical socket which co-operate with the spheroidal head of the pin to form an articulated joint therewith.

It is desirable that a groove or slot be made in the pin for the osseous tissue to intrude into. A hole may be provided in the pin for a screw to attach the pin to the humeral bone.

The pin may also be provided with lugs having holes so that ligatures may be used to fix the muscles of the shoulder girdle to the pin.

It is expedient that the deformable portions of the shaped crown of the endoprosthesis of the shoulder joint include tongues to insist in fixing the crown to the articular process of the scapula. In addition certain of the holes in the crown are arranged to receive screws to attach the crown on to the articular process, and certain of said holes in the shaped crown are provided for the osseous tissue to introduce into. It is desirable that the deformable portions of the walls of the shaped crown include portions split by slits into segments which, when compressed, ensure that the osseous tissue of the articular process of the scapula is tightly embraced by the walls of the crown.

The shaped crown may have a flute to accommodate the tendon to the long head of the brachial biceps muscle.

An advantageous feature of the herein-proposed endoprosthesis of the shoulder joint is its being firmly attached to the scapular bone by virtue of the crown head being fitted to the articular process thereof. Such an attachment serves as a fulcrum for the humerus, is instrumental in rendering the joint stable and allows mobility in the articulated joint due to the shoulder girdle

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muscles being attached to the movable portion of the endoprosthesis, viz., to the pin thereof.

- 5 An embodiment of the present invention will now be described by way of example with reference to the accompanying drawings in which:—

10 Fig. 1 illustrates a general side-elevation, partly sectional view of an endoprosthesis of the shoulder joint, according to the invention.

Fig. 2 is a shaped crown as viewed along the arrow A in Fig. 1; and

15 Fig. 3 is the shaped crown as viewed along the arrow B in Fig. 1.

Reference being first made to Fig. 1, an endoprosthesis of the shoulder joint comprises a pin 1 adapted to be fixed in the medullary canal of the humerus by having a 20 groove 2 for the osseous tissue to intrude into and an open-end hole 3 for a medical screw. The pin 1 has a curved neck 4 provided with projecting lugs having open-end holes 5 through which ligatures may pass. The pin 1 terminates in a spheroidal head 6. The endoprosthesis also comprises a 25 shaped crown 7 adapted to be fixed on the articular process of the scapula. The shaped crown 7 has a part spherical socket 8 (Figs 1, 2) adapted to interact with the spheroidal head 6 (Fig. 1) to form an articulated joint therewith.

30 The pin 1 is removable from the shaped crown 7 so that a single crown may be used with different lengths of pins 1 each having a similar spheroidal head 6. This allows the surgeon to select the length of the pin 1 required for a given operation.

40 Lateral walls 9 of the shaped crown 7 have holes 10 for the osseous tissue to intrude into. The lateral walls 9 are split into segments by slits 11 so as to allow the surgeon to easily deform the walls of the shaped crown 7 to make them tightly embrace the osseous tissue when the shaped 45 crown 7 is fitted to the articular process of the scapula.

50 A flute 12 (Fig. 2) is provided on the shaped crown to accommodate the tendon of the long head of the brachial biceps muscle, and holes 13 are provided through which ligatures may pass. Holes 14 with guide channels, arranged at different levels and adapted to receive screws to fix the 55 shaped crown 7 to the substance of the articular process of the scapula are also provided.

60 The edges of the lateral walls 9 of the shaped crown 7 terminate in tongues 15 adapted to assist in fixing the shaped crown 7 to the articular process.

65 The herein-disclosed endoprosthesis of the shoulder joint may completely replace the shoulder joint in cases of grave comminuted fractures of the head of the

humerus, resection of the latter due to tumoral or malignant processes, the presence of a flail shoulder joint due to its vitiation and in cases of ankylosis of the shoulder joint. This replacement has the result that stability and mobility of the arm is ensured, the anatomical proportions of the arm with respect to the trunk remain unaffected, the arm has a positive fulcrum due to its being fixed to the scapula, the axes of movements of the artificial joint correspond to those of a natural joint, the anterior and posterior groups of scapular muscles are kept attached to the joint movable portion, where by the active functions of flexion, extension, abduction, adduction and rotation of the shoulder joint are ensured.

Besides, the entire endoprosthesis is located in the bulk of the tissues and is reliably covered by a bulky muscular layer on every side being firmly attached to the scapular and humeral bones.

#### WHAT WE CLAIM IS:—

1. An endoprosthesis of the shoulder joint, comprising a pin adapted to be fixed in the medullary canal of the humerus and provided at one end with a spheroidal head; and a shaped crown having holes therethrough and deformable portions, by means of which the crown is adapted to be fixed on the articular process of the scapula, the crown having a part spherical socket which co-operates with the spheroidal head of the pin to form an articulated joint therewith.

2. An endoprosthesis of the shoulder joint as claimed in Claim 1, wherein the pin has a groove for the osseous tissue to intrude therinto.

3. An endoprosthesis of the shoulder joint as claimed in either Claims 1 or Claim 2 wherein the pin has a hole for a screw to fix the pin to the humeral bone.

4. An endoprosthesis of the shoulder joint as claimed in any of Claims 1 to 3, wherein the pin is provided with lugs having holes through which muscle-fixing ligatures may pass.

5. An endoprosthesis of the shoulder joint as claimed in any of Claims 1 to 4, wherein the deformable portions of the shaped crown include tongues to assist in fixing crown on to the articular process of the scapula.

6. An endoprosthesis of the shoulder joint as claimed in any of Claims 1 to 5, wherein certain of said holes in the shaped crown are arranged to receive screws to fix the crown to the articular process of the scapula.

7. An endoprosthesis of the shoulder joint as claimed in any of Claims 1 to 6, wherein certain of said holes in the crown are provided for the osseous tissue to intrude into.

5 8. An endoprosthesis of the shoulder joint  
as claimed in any of Claims 1 to 7, wherein  
the deformable portions of the shaped  
crown include portions of the crown which  
are split by slits into segments which, when  
compressed, enable the osseous tissue to be  
tightly embraced by the walls of the crown.

10 9. An endoprosthesis of the shoulder joint  
as claimed in any of Claims 1 to 8, wherein  
the shaped crown has a flute to ac-  
commodate the tendon of the long head of  
the brachial biceps muscle.

10. An endoprosthesis of the shoulder  
joint as claimed in any of Claims 1 to 9,

wherein certain of the holes in the shaped 15  
crown are arranged so that muscle-fixing  
ligatures may pass therethrough.

11. An endoprosthesis of the shoulder 20  
joint, substantially as hereinabove described  
with reference to the accompanying  
drawings.

**FITZPATRICKS,**  
Chartered Patent Agents,  
14--18 Cadogan Street,  
Glasgow, G2 6QW, and  
Warwick House,  
Warwick Court,  
London, WC1R 5DJ.

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